

Subject: Re: ice Re: Snow Re: Vegetation in CRTM

From: Ronald.Vogel@noaa.gov

Date: Mon, 03 Aug 2009 08:44:47 -0400

To: Michiko Masutani <Michiko.Masutani@noaa.gov>

CC: "Quanhua (Mark) Liu" <Quanhua.Liu@noaa.gov>, Jack Woollen <Jack.Woollen@noaa.gov>, David Groff <David.Groff@noaa.gov>, Yong.Han@noaa.gov, Paul van Delst <Paul.Vandelst@noaa.gov>

Hi Michiko

There is only one ice type in CRTM for IR.
As long as you have any amount of sea ice coverage (value X > zero)
included in

```
Surface(iprofile)%Ice_Coverage = X
```

then CRTM will calculate IR surface emissivity using the single ice
type. There really isn't a need to make any type selection. This
applies to IR only. I'm not familiar with the MW selections.

Ron

----- Original Message -----

From: Michiko Masutani <Michiko.Masutani@noaa.gov>

Date: Sunday, August 2, 2009 8:46 pm

Subject: ice Re: Snow Re: Vegetation in CRTM

Ron:

Thank you very much. This is great.
It seems CRTM is already prepared for ECMWF parameter.
I have to go over carefully and write a code.

We have to simulate both IR and MW. It seems we have to set
differently.

Then I realize there are more than one ice type. Is there any
convention you use?
new ice is 24 but is there any value assigned for old ice?

It seems we can figure out from GSI code?

Michiko

Ronald.Vogel@noaa.gov wrote:

Hi Quanhua,

Here is how I use snow in my CRTM applications. Do you have other
advice for Michiko?

From Weizhong Zheng's code (based on GSI code), snow is
determined when
snow depth (mm) > 0.1

Snow water equivalent (SWE from ECMWF) needs to be changed to snow
depth. Multiply by conversion factor 5 for old snow, and 10 for
fresh snow.

```
    snow depth (m) = SWE * 5    <-conversion factor for old snow  
    snow depth (mm) = snow depth (m) * 1000.
```

For points where snow depth (mm) > 0.1, assign CRTM snow like this:

```
Surface(iprofile)%Snow_Type = 13  
or  
Surface(iprofile)%Snow_Type = CRUST_SNOW
```

(the 2 assignments mean the same thing)

This selects the 'old snow' emissivity spectrum, which is adequate for IR sensors. Snow emissivity doesn't vary between 'old snow' and 'fresh snow' in mid-to-thermal IR (does vary in NIR however), so the 2 choices of 'old snow' or 'fresh snow' don't make much difference for IR sensors (> 3.7 um). NOTE: 'old snow' and 'fresh snow' are the only choices currently available in CRTM for IR (i.e. Snow_Type = 13 or 14).

The above applies for IR sensors, but we have never really figured out how the snow depth threshold impacts the accuracy of CRTM TOA calculation (for IR). Rather, I include snow-covered land in my CRTM calculations, but then remove it in my statistics (since currently I'm more interested in non-snow-covered land than snow-covered land).

Also, I'm not sure if Michiko is more interested in IR or MW.

The above might be adequate for Michiko. Any other suggestions?
Ron

----- Original Message -----

From: Michiko Masutani <Michiko.Masutani@noaa.gov>
Date: Friday, July 31, 2009 6:27 pm
Subject: Snow Re: Vegetation in CRTM

Mark and Ron

I realize CRTM handle various type of snow.
CRTM handle various type of snow in 24 surface type

- ! 1. water 2. old snow 3.
- fresh snow
- ! 4. compacted soil 5. tilled soil 6.
- sand>> ! 7. rock 8. irrigated low vegetation
- 9.
- meadow
- grass
- ! 10. scrub 11. broadleaf forest 12.
- pine forest
- ! 13. tundra 14. grass soil 15.
- broadleaf pine forest
- ! 16. grass scrub 17. oil grass 18.
- urban
- concrete
- ! 19. pine brush 20. broadleaf brush 21.
- wet soil
- ! 22. scrub soil 23. broadleaf 70-pine 30 24.
- new ice
- !

ECMWF model has six snow related values.

- 2 kpds=032 Snow albedo [(0-1)]
- 3 kpds=033 Snow density [kg m**-3]
- 5 kpds=044 Snow evaporation [m of water]
- 6 kpds=045 Snowmelt [m of water]
- 16 kpds=141 Snow depth [m of water equiv

19 kpds=144 Snowfall (convective + strat

I assume there is a standard way to convert these values to

surface

type.
Michiko

Michiko Masutani wrote:

Ron:
Thank you very much.
Michiko

Ronald.Vogel@noaa.gov wrote:

Hi Michiko,

Yes, I will provide you with a match of ECMWF vegetation

information to

CRTM land types. However, with the low and high types (plus

cover>>> fraction) contained in ECMWF model data, it is not so straightforward. Likely, it will require a simple algorithm, something like this:

if cover_low_veg > 0.8, then low_type matches to CRTM type_X
else high_type matches to CRTM type_Y

I will look at it in detail over the weekend and respond to

you

with the

match-ups next week.

Ron

----- Original Message -----

From: Michiko Masutani <Michiko.Masutani@noaa.gov>

Date: Friday, July 31, 2009 2:25 pm

Subject: Vegetation in CRTM

Ron:

I am trying to simulate radiance data from ECMWF model data. In ECMWF model Vegetation is represented by 4 climatological parameters: vegetation cover of low vegetation, vegetation

cover of

high vegetation, low vegetation type and high vegetation

type.

I

have attached the description of H and L vegetation.

In CRTM I found following definition. I wonder if you can

help

me

to interpret ECMWF model information to CRTM.
Michiko

! PUBLIC PARAMETERS:

! 1) The type of land surface using in the

Surface%Land_Type

field:!

!
!

Land type

Parameter Name

--

--

!
! Invalid
! Compacted soil
! Tilled soil
! Sand
! Rock
! Irrigated low vegetation

INVALID_LAND
COMPACTED_SOIL
TILLED_SOIL
SAND
ROCK

IRRIGATED_LOW_VEGETATION>>> !

Meadow grass

MEADOW_GRASS

!
! Scrub
! Broadleaf forest
! Pine forest
! Tundra
! Grass soil
! Broadleaf-pine forest

SCRUB
BROADLEAF_FOREST
PINE_FOREST
TUNDRA
GRASS_SOIL

BROADLEAF_PINE_FOREST>>>>> !

Grass scrub

GRASS_SCRUB

!
! Oil grass
! Urban concrete
! Pine brush
! Broadleaf brush
! Wet soil
! Scrub soil
! Broadleaf(70)-Pine(30)
!
!
!

OIL_GRASS
URBAN_CONCRETE
PINE_BRUSH
BROADLEAF_BRUSH
WET_SOIL
SCRUB_SOIL
BROADLEAF70_PINE30

2) The type of water surface using in the

Surface%Water_Type

field:

Water type	Parameter Name
Invalid	INVALID_WATER
Sea water	SEA_WATER
Fresh water	FRESH_WATER

3) The type of snow surface using in the

Surface%Snow_Type

field:!

Snow type	Parameter Name
Invalid	INVALID_SNOW
Wet snow	WET_SNOW
Grass after snow	GRASS_AFTER_SNOW
Powder snow	POWDER_SNOW
RS snow(A)	RS_SNOW_A
RS snow(B)	RS_SNOW_B
RS snow(C)	RS_SNOW_C
RS snow(D)	RS_SNOW_D
RS snow(E)	RS_SNOW_E
Thin Crust snow	THIN_CRUST_SNOW
Thick crust snow	THICK_CRUST_SNOW
Shallow snow	SHALLOW_SNOW
Deep snow	DEEP_SNOW
Crust snow	CRUST_SNOW
Medium snow	MEDIUM_SNOW
Bottom crust snow(A)	BOTTOM_CRUST_SNOW_A
Bottom crust snow(B)	BOTTOM_CRUST_SNOW_B

4) The type of ice surface using in the

Surface%Ice_Type

field:!

Ice type	Parameter Name
Invalid	INVALID_ICE
Fresh ice	FRESH_ICE
First year sea ice	FIRST_YEAR_SEA_ICE
Multiple year sea ice	MULTI_YEAR_SEA_ICE
Ice floe	ICE_FLOE
Ice ridge	ICE_RIDGE

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